

**SUPERIOR COURT OF THE DISTRICT OF COLUMBIA  
CIVIL DIVISION**

Mark Z. Jacobson, Ph.D.,

Plaintiff,

v.

Christopher T.M. Clack, Ph.D.

and

National Academy of Sciences,

Defendants.

2017 CA 006685 B

Judge Elizabeth Wingo

Next Court Date: None Scheduled

**DECLARATION OF DR MARK O. DIESENDORF**

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## **Declaration of Dr Mark O. Diesendorf**

1. My name is Mark O. DIESENDORF, I am over the age of 18 years and am competent to make the following declaration.
2. I am currently Honorary Associate Professor at UNSW Sydney, formerly called the University of New South Wales. Previously, at various times before my nominal retirement in 2016, I was a Principal Research Scientist in Australia's national research organization, CSIRO; Professor of Environmental Science and Founding Director of the Institute for Sustainable Futures at University of Technology Sydney; Associate Professor and Deputy Director of the Institute of Environmental Studies at UNSW Sydney; and Education Program Leader of the Australian Cooperative Research Centre for Low Carbon Living. As an author or coauthor, I have published 78 peer-reviewed journal papers, three scholarly books, 36 scholarly book chapters and 13 peer-reviewed conference papers.
3. From 2011 to 2016 I was a senior researcher in a research program at UNSW Sydney that performed computer simulation modelling of the operation of the Australian National Electricity Market running entirely on renewable energy. I am co-author of several peer-reviewed journal papers on this particular topic. This research is similar to that conducted on the electricity systems of the United States of America by Dr Mark Jacobson. Therefore, I have expertise in the scientific issues discussed in Dr Jacobson's and Dr Clack's journal papers published in PNAS in 2015 and 2017 respectively. I have studied both papers.
4. I understand that Dr Jacobson has initiated litigation against Dr Clack on the grounds that the Clack paper and public statements by Dr Clack misrepresent Dr Jacobson's paper.
5. I have not been involved in this litigation prior to making this declaration am not a co-author of either of the papers relevant to this litigation.
6. Dr Jacobson has requested my expert opinion on whether three issues raised in the case are matters of fact or of scientific disagreement.

7. As a scientist, I understand that a fact is something that has either been proven to be true or is true by definition or logical argument. The following are examples of facts:
  - 7.1 That I am an Australian citizen, because it can be verified by inspection of my birth certificate and passport.
  - 7.2 That, if 2 and 3 are real numbers,  $2 + 3 = 3 + 2 = 5$ .
  - 7.3 That the Earth is warming, because it has been verified by scientific measurements taken over decades by many independent research groups based in different countries.
8. As a scientist, I understand that a scientific disagreement can occur when we have incomplete information about the system of interest and different scientific hypotheses can be held that are consistent with the available data, logic and existing scientific facts. For example, it is at present a matter of scientific disagreement as to whether there is any kind of life on Mars or whether human-induced climate change is already irreversible by human actions.
9. I wish to emphasize that disagreement between scientists is not always the same as 'scientific disagreement'. For example, a scientist who dislikes me could claim incorrectly that I am not an Australian citizen, although I can supply strong documentary evidence to show that I am an Australian citizen. This disagreement between scientists is not a scientific disagreement, because the scientist making the incorrect claim is not basing it on science but rather on emotion.
10. Another example of a disagreement between scientists that is not a scientific disagreement is the following. Based on their religious beliefs, a scientist could claim that the earth was created literally in seven days, but to do this they would have to ignore all the fossil, geological and biological evidence to the contrary; this disagreement is not a scientific disagreement.
11. Dr Jacobson asserts that the following three questions raised in the litigation are issues of fact and not issues of scientific disagreement:
  - 11.1 Does Table 1 of the Jacobson paper, published in PNAS in 2015, contain maximum or average values?

11.2 Did the Jacobson PNAS paper contain imported Canadian hydro power as part of its results?

11.3 Is there a modelling error in Jacobson's LOADMATCH computer code that he used in his PNAS paper?

12. My assessment is that Question 11.1 is a question of fact that I have verified from studying both the Jacobson PNAS paper itself and its reference 22 (also by Jacobson), which is the source of the data in Table 1 of Jacobson's PNAS paper. Furthermore, the latter reference states clearly on page 2095 that 'The table is derived from a spreadsheet analysis of annually *averaged* end-use load data' (my italics). Therefore, the answer to Question 11.1 is 'average', as stated by Jacobson.
13. My assessment is that Question 11.2 is a question of fact that I have verified from both the Jacobson PNAS paper itself together with its reference 22, which states clearly on page 2102 that 'In addition, 23 U.S. states receive an estimated 5.103 GW of delivered hydroelectric power *from Canada*' (my italics). Therefore, the answer to Question 11.2 is 'yes', as stated by Jacobson.
14. Whether Question 11.3 is a question of fact or of scientific disagreement depends on the definition of 'modeling error'. As a modeler myself, I believe that the vast majority of scientists would interpret 'modeling error' as an error or bug in the computer code, as I do. Such an apparent scientific disagreement can be resolved *factually* from expert examination of the computer code and the model output. To establish the existence of such a modelling error, Clack would have to present evidence identifying it. His paper fails to do this and therefore fails to establish that there is a genuine scientific disagreement.
15. Instead, Clack's paper identifies results he contests in Jacobson's paper and includes them in the section of Clack's paper called 'Modeling Errors'. In my assessment the Clack paper is claiming the contested results are due to computer bugs in the LOADMATCH computer model.
16. In particular, the following statement is in the Clack paper's section on Modeling Errors:

‘In fact, the flexible load used by LOADMATCH is more than double the maximum possible value from table 1 of ref. 11. The maximum possible from table 1 of ref. 11 is given as 1,064.16 GW, whereas figure 3 of ref. 11 shows that flexible load (in green) used up to 1,944 GW (on day 912.6). Indeed, in all of the figures in ref. 11 that show flexible load, the restrictions enumerated in table 1 of ref. 11 are not satisfied.’

In my reading, the quoted sentences claim that Jacobson’s paper has a software bug, because Jacobson’s figures don’t match their Table 1. But this claim is based on Clack’s factually incorrect reading of the values in Jacobson’s Table 1, as pointed out in Paragraph 12 of this Declaration. Clack has assumed incorrectly that Jacobson’s Table 1 contains maximum values when it actually contains average values. Therefore, this Claim by Clack, that Jacobson’s paper contains a modelling error, i.e. an error or bug in the computer code, has not been established.

17. Similarly, the following statement is in the Clack paper’s section on Modeling Errors:

‘For example, the numbers given in the supporting information of ref. 11 imply that maximum output from hydroelectric facilities cannot exceed 145.26 GW (SI Appendix, section S1.1), about 50% more than exists in the United States today (15), but figure 4B of ref. 11 (Fig. 1) shows hydroelectric output exceeding 1,300 GW.’

Once again, I read this as a claim that Jacobson’s paper contains an error or bug in the computer code, because the Clack paper states Jacobson’s figure 4B, which derives from the LOADMATCH computer program, has values that exceed 145.26 GW, thus a discrepancy exists between model output and other data from the paper. Again, whether such a difference is due to a computer bug can be determined factually, thus is a question of fact, not a question of scientific disagreement.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 4 August 2020.

Mark Oliver Diesendorf